

Atty. Docket No. 420228

REMARKS/ARGUMENTS

The amendments and remarks hereto attend to all outstanding issues in the pending office action of 7 October 2005. Claims 1, 3-8, 10-12, 14, 16-19, 21 and 23-29 remain pending in this application. Claims 1, 4, 5, 10, 11, 18 and 21 are currently amended without adding new matter. Claims 2 and 20 are cancelled herewith without prejudice.

In the Claims

Claim 1 is amended to clarify that an optical imaging system comprises, *inter alia*, a first controller for positioning an optical phase filter to alter phase of a wavefront of the imaging system and change one or both of (a) a depth of field and (b) aberration tolerance of the imaging system, a user interface for selecting at least one of the depth of field and aberration tolerance, and a second controller, responsive to user selections at the interface, to direct the first controller to position the optical phase filter to change the depth of field and aberration tolerance, as selected. This amendment is supported by claims 1, 2 and 13 as filed, and in the specification as filed at paragraph [0033].

Claim 4 is amended by rewriting it in independent form including the limitations of its previous base claim. This amendment is supported by claims 1, 2, 4 and 13 as filed.

Claim 5 is amended to depend from claim 1 instead of claim 4.

Claim 10 is amended by rewriting it in independent form including the limitations of its previous base claim. This amendment is supported by claims 1, 2, 10 and 13 as filed.

Claim 11 is amended by rewriting it in independent form including the limitations of its previous base claim. This amendment is supported by claims 1, 2, 11 and 13 as filed.

Claim 18 is amended to clarify that an optical imaging system comprises, *inter alia*, a controller for positioning an optical phase filter to alter phase of a wavefront of the imaging system to change at least a selected one of depth of field and aberration tolerance. This amendment is supported by claims 1, 2, 13 and 18 as filed, and in the specification as filed at paragraph [0033].

Atty. Docket No. 420228

Claim 21 is amended for consistency with amended claim 18, from which it depends. This amendment is supported by claims 1, 2, 13, 18 and 21 as filed, and in the specification as filed at paragraph [0033].

Claims 2 and 20 are cancelled without prejudice and may be pursued in a continuation or divisional application.

No new matter is added to the application through any of the claim amendments.

Response to Office Action

The following paragraphs follow the order of the paragraphs in the Office Action mailed 7 October 2005 in this application.

1. - 3. Claim Rejections – 35 USC §102

Claims 1, 2, 6-8, 14 and 20-21 stand rejected as being anticipated by U.S. Patent No. 5,233,431 ("Yoshida"). Applicant respectfully disagrees. To anticipate a claim, the reference must teach every element of the claim and "the identical invention must be shown in as complete detail as is contained in the ... claim." *MPEP 2131* citing *Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628, 2 USPQ2d 1051 (Fed. Cir. 1987) and *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913 (Fed. Cir. 1989).

Applicants' claim 1, as amended, requires the following elements:

- (a) at least one optical phase filter;
- (b) a first controller for positioning the optical phase filter to alter phase of a wavefront of the imaging system and change one or both of (a) depth of field and (b) aberration tolerance of the imaging system;
- (c) a user interface for selecting at least one of the depth of field and aberration tolerance; and
- (d) a second controller, responsive to user selections at the interface, to direct the first controller to position the optical phase filter to change the depth of field and aberration tolerance, as selected.

Atty. Docket No. 420228

Elements (b), (c) and (d) of Applicants' claim 1, as amended, are not found in Yoshida. Yoshida does not show a controller for positioning an optical filter to alter phase of a wavefront of the imaging system and change one or both of a depth of field and aberration tolerance of the imaging system. Yoshida includes an item 46 labeled a "rotary mechanism" (e.g., in FIG. 1) that the Examiner likens to "a first controller." Office Action, page 2. However, Yoshida's rotary mechanism 46 is utilized to position a phase filter to optimize a signal from an autofocus detect circuit, and to initiate a shutter release, respectively: "In this case, at first, the phase type OLPF 10 is rotated 90° through a rotary mechanism 46 ... and after then the microcomputer 38 outputs a control signal to the focus drive mechanism 40 so that the evaluation value input from the AF detect circuit 36 becomes the greatest, thereby driving the focus lens within the taking lens 20 for focusing. And, if the shutter release button is completely pushed in the operation part 42, then the phase type OLPF 10 is rotated to a given rotational position corresponding to the focal distance of the taking lens 20 before the shutter is released." Yoshida, col. 5, lines 39-51. Yoshida, then, utilizes rotary mechanism 46 to position OLPF 10 as part of an auto-focusing system which sets focal distance: "Accordingly, it is an object of the invention to provide an image pickup device which, when placing a phase type OLPF in front of a taking lens, is able to correspond to the varying focal distances of the taking lens with a single phase type OLPF, and is thus advantageous in space and cost. It is another object of the invention to provide an image pickup device which is able to remove a false signal by the OLPF and at the same time is able to obtain a large quantity of information for focusing detection in auto-focusing (AF)." Yoshida, col. 2, lines 12-22. Yoshida does not mention, let alone control, depth of field and/or aberration tolerance. It should be apparent that focal distance is different from depth of field.

Similarly, Yoshida does not show a user interface for selecting at least one of the depth of field and aberration tolerance. Yoshida includes an item 42 labeled an "operation part" (e.g., in FIG. 1) that the Examiner likens to "a user interface (42)." Office Action, page 2. However, Yoshida's operation part 42 appears to be a device that detects the position of a shutter button: "...when a shutter release button (not shown) is halfway pushed in an operation part 42, instructs that the focusing of the taking lens 20 is executed. ... And, if the shutter release button is completely pushed in the operation part 42, then the phase type OLPF 10 is rotated to a given rotational position corresponding to the focal distance of the taking lens 20 before the shutter is released." Yoshida, col. 5, lines 37-51. Yoshida, then, utilizes operation part 42 to detect

Page 9 of 16

Response to nonfinal Office Action in Application No. 10/810,446

Atty. Docket No. 420228

position of a shutter button, and accordingly executes an auto-focus operation or releases a shutter. Yoshida does not mention, nor show, a user interface for selecting depth of field and/or aberration tolerance.

Similarly, Yoshida does not show a second controller, responsive to user selections at the interface, to direct the first controller to position the optical phase filter to change the depth of field and aberration tolerance, as selected. Yoshida includes an item 38 labeled a "micro-computer" (e.g., in FIG. 1) which, along with operation part 42, the Examiner likens to "a second controller (control signal from 42 and 38)." Office Action, page 2. However, for reasons similar to those listed above, Yoshida does not disclose "a second controller, responsive to user selections at the interface, to direct the first controller to position the optical phase filter to change the depth of field and aberration tolerance, as selected." Yoshida does not show that elements 46, 42 and 38 (or any other elements) are capable of changing depth of field and/or aberration tolerance.

For at least the reasons listed above, Applicants request reconsideration and withdrawal of the rejection of claim 1 as anticipated by Yoshida under 35 U.S.C. §102(b).

As noted above, claims 2 and 20 are cancelled herewith without prejudice and may be pursued in a continuation or divisional application.

Claims 6-8, 14 and 21 depend directly or indirectly from claim 1 and benefit from like arguments; Applicant therefore requests reconsideration and withdrawal of the rejection of claims 6-8, 14 and 21 as anticipated by Yoshida under 35 U.S.C. §102(b). However, claims 6-8, 14 and 21 contain additional elements not found in Yoshida.

For example, claim 7 requires "the first controller translating the optical phase filter between at least two positions wherein the wavefront passes through at least two separate portions of the optical phase filter." The Examiner says "Regarding claim 7, Yoshida discloses the optical imaging system of claim 1, the controller translating the optical phase filter between at least two positions (different angles) wherein the wave front passes through at least two separate portions (lenticular sheet) of the optical phase filter (see col. 4, lines 15-69 and col. 5, lines 40-69)." Office Action, page 3. The Examiner's comment mischaracterizes the word "translating" as including rotating through "different angles," which is incorrect in a physical or mathematical sense. "Translating," as used in physics or mathematics, means displacement in a

Page 10 of 16

Response to nonfinal Office Action in Application No. 10/810,446

Atty. Docket No. 420228

linear sense, as opposed to rotating; Applicants' use of "translating" in claim 7 and in the specification (e.g., see paragraphs [0034], [0037], [0039], [0041]) clearly does not include, and is distinguished from, rotating. The distinction is perhaps clearest at paragraph [0039]: "In another embodiment shown in FIG. 2B, motor and controller 30 translates optical phase filter 14B transverse to optical axis 17 (e.g., perpendicular to axis 17) along movement direction 44..." Specification, paragraph [0039], emphasis added. The indication that translating is transverse to an optical axis clearly distinguishes such movement from rotation about the axis. Furthermore, claim 7 requires that "the wavefront passes through at least two separate portions of the optical phase filter." FIG. 2B, the detailed description of which is the above-mentioned paragraph [0039], shows the "two separate portions" through which a wavefront passes when filter 14B is at position A and position B. Yoshida does not disclose or even suggest that a wavefront passes through two separate portions of an optical phase filter. On the contrary, FIG. 1, FIG. 2, FIG. 4 and FIG. 5 of Yoshida show that OLPF 10 rotates about an optical axis, and that light from "taking lens 20" is also centered about the optical axis, therefore a wavefront passes through the same portion of OLPF 10 irrespective of its rotation about the axis. Since the "translating the optical phase filter between at least two positions" and "wherein the wavefront passes through at least two separate portions of the optical phase filter" elements of claim 7 are not found in Yoshida, claim 7 is not anticipated by Yoshida. Reconsideration is requested.

In another example of an element missing in Yoshida, claim 21, as amended, requires "the depth of field and aberration tolerance, as selected, remain substantially fixed irrespective of the means for adjusting." As discussed with respect to claim 1, Yoshida does not mention or control, depth of field and/or aberration tolerance. Since the "selected depth of field and aberration tolerance remains substantially fixed irrespective of the means for adjusting" element of claim 21 is not found in Yoshida, claim 21 is not anticipated by Yoshida. Reconsideration is requested.

4. - 6. Claim Rejections – 35 USC §103(a)

Claims 3, 16 and 17-19 stand rejected as being unpatentable over Yoshida. Applicant respectfully disagrees. The following is a quotation from the MPEP setting forth the three basic criteria that must be met to establish a *prima facie* case of obviousness.

Atty. Docket No. 420228

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2142, citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

First, Applicants note that claims 3, 16 and 17 depend directly or indirectly from claim 1, argued above as allowable, and are thus also believed allowable. However, claims 3, 16 and 17 contain additional elements not found in Yoshida.

For example, claim 3 requires "the at least one optical phase filter comprising first and second optical filters." The Examiner concedes that "Yoshida discloses the claimed invention except for a first and second phase filter." Office Action, page 4. However, other parts of the rejection of claim 3 read, in part, "Yoshida discloses the optical imaging system of claim 1, with a two dimensional phase filter having a two dimensional phase function... One would have been motivated to make the elements separable for the purpose of ensuring the phase change of the wave in either direction of propagation (orthogonal propagations)." Office Action, page 4. However, Yoshida does not disclose a "two dimensional phase function" as the Examiner alleges. FIG. 2 of Yoshida shows explicitly that item 10 has a pitch P in a first dimension, but not in a second dimension, of a two-dimensional "OLPF 10." The pitch P shown in the first direction (e.g., a direction that is horizontal in FIG. 2) simply extends vertically through OLPF 10; no phase change is shown in the second direction (e.g., the vertical direction in FIG. 2). Yoshida explains "Here, as shown in FIG. 2, when the phase type OLPF 10 having a pitch P is rotated by an angle of θ , then a pitch P' , which is an apparent pitch in a horizontal direction, can be expressed by the following equation: $P' = P/\cos \theta$ " Yoshida, col. 4, lines 38-46. Thus, there is no teaching of a phase filter having a two-dimensional phase function. The Examiner's statement that "One would have been motivated to make the elements separable for the purpose of ensuring the phase change of the wave in either direction of propagation (orthogonal propagations)" is speculation and is not supported by Yoshida or knowledge generally available in the art.

In fact, the principle taught in FIG. 2 of Yoshida teaches away from a two-dimensional phase function. If there were a phase function in the second dimension of OLPF 10, rotation of

Atty. Docket No. 420228

OLPF 10 would project a second phase component in the horizontal direction that Yoshida illustrates, disrupting the effect of the first phase component and rendering such a device unsuitable for Yoshida's intended purpose.

Since the "at least one optical phase filter comprising first and second optical filters" element of claim 3 is not found in Yoshida, nor found in knowledge generally available in the art, reconsideration of the rejection of claim 3 under 35 U.S.C. §103(a) as obvious over Yoshida is requested.

Claim 17 requires that "the phase mask implements a phase function of the form: $P(r,\theta)_c = [2\cos(3\phi)] \propto r^3 \cos(3\theta)$." The Examiner asserts "It would have been further obvious to one of ordinary skill in the art at the time the invention was made to use a cubic phase form, since the image would be provided with a near constant transfer function." Office Action, page 5. This assertion is not only made in hindsight, unsupported by documentary evidence as to what is obvious to one of ordinary skill in the art; it is also insufficient as a basis for rejection of claim 17.

In order to support a *prima facie* case of obviousness, the Examiner bears the burden of pointing out how "the prior art reference (or references when combined) ... teach or suggest all the claim limitations." First, the Examiner appears to be relying on "Official Notice" of what is obvious to one skilled in the art. The Examiner asserts: "It would have been further obvious to one of ordinary skill in the art ... to use a cubic phase form, since the image would be provided with a near constant transfer function." Office Action, page 5. Applicants disagree that even utilizing a cubic phase form, let alone a phase function of the form $P(r,\theta)_c = [2\cos(3\phi)] \propto r^3 \cos(3\theta)$, is not obvious to one skilled in the art, and request documentary evidence pursuant to MPEP 2144.03(C) to support the Examiner's assertion. We submit that the above-quoted assertion can be made only in impermissible hindsight.

Furthermore, Applicants point out that "a phase function of the form $P(r,\theta)_c = [2\cos(3\phi)] \propto r^3 \cos(3\theta)$ " includes terms of $2\cos(3\phi)$ and $\cos(3\theta)$, each of which causes the phase function to be asymmetric about an axis of rotation about which ϕ and θ are measured. Thus the nonobviousness of claim 17 includes not only use of a cubic phase function, but also the use of

Atty. Docket No. 420228

$2\cos(3\phi)$ and $\cos(3\theta)$ terms. No explanation concerning the obviousness of $2\cos(3\phi)$ and $\cos(3\theta)$ terms of the phase function required in claim 17 has been offered.

Absent proof that all of the elements of claim 17, and the motivation to combine them, are disclosed or suggested by prior art or knowledge generally available in the art, Applicants maintain that claim 17 is patentable. Reconsideration is requested.

Applicants' claim 18, as amended, requires the following elements:

- (a) at least one optical phase filter including a phase mask; and
- (b) a controller for positioning the optical phase filter to alter phase of a wavefront of the imaging system to change at least a selected one of depth of field and aberration tolerance;
- (c) wherein the phase mask implements a cubic phase function when moved by the controller.

Elements (b) and (c) claim 18, as amended, are not found in Yoshida or in the knowledge generally available in the art. As noted with respect to claim 1, Yoshida does not show a controller for positioning an optical filter to alter phase of a wavefront of the imaging system to change at least a selected one of depth of field and aberration tolerance. Yoshida does not mention, let alone control, depth of field and/or aberration tolerance. As noted with respect to claim 17, the assertion "It would have been further obvious to one of ordinary skill in the art ... to use a cubic phase form, since the image would be provided with a near constant transfer function." can be made only in impermissible hindsight and is unsupported by documentary evidence as to what is obvious to one of ordinary skill in the art. We again request documentary evidence pursuant to MPEP 2144.03(C) to support this assertion, if the rejection of claim 18 is maintained. Absent proof that all of the elements of claim 18, and the motivation to combine them, are disclosed or suggested by prior art or knowledge generally available in the art, Applicants maintain that claim 18 is patentable. Reconsideration is requested.

Claim 19 depends from claim 18, and benefits from like arguments; however, claim 19 also requires that "the cubic phase function is of the form: $P(x,y) = \alpha x^3 + \beta y^3 + \delta x^2y + \gamma xy^2$ where $P(x,y)$ represents phase as a function of the spatial coordinates (x,y) ." Although the current Office Action does not explicitly state which argument belongs to each claim that is rejected, the Examiner may intend that the assertion that "It would have been further obvious to

Atty. Docket No. 420228

one of ordinary skill in the art ... to use a cubic phase form, since the image would be provided with a near constant transfer function" pertains to claim 19. If so, we request documentary evidence pursuant to MPEP 2144.03(C) that knowledge generally available in the art includes knowledge to utilize not only a "cubic" phase function, but a function of the specific form $P(x,y) = \alpha x^3 + \beta y^3 + \delta x^2y + \gamma xy^2$ where $P(x,y)$ represents phase as a function of the spatial coordinates (x,y) . Absent proof that the particular phase function required by claim 19, and the motivation to utilize it, are disclosed or suggested by prior art or knowledge generally available in the art, Applicants maintain that claim 19 is patentable. Reconsideration is requested.

Claim 5 stands rejected as being unpatentable over Yoshida in view of U.S. Patent No. 5,322,998 ("Jackson"). Applicants respectfully disagree and note that claim 5 depends from claim 1, argued above as allowable over the art of record. Reconsideration is requested.

7. - 9. Allowable Subject Matter

We appreciate the allowance of claims 23-29.

We note the Examiner's indication of claims 4, 10-12 as allowable if rewritten in independent form including limitations of the base claims and intervening claims. Claims 4, 10 and 11 are therefore rewritten in independent form including limitations of previous claim 1. Claim 12 is believed allowable without amendment as it continues to depend from claim 11, which is believed allowable as per above.

We note the Examiner's indication of allowable subject matter includes the statement: "the prior art fails to teach a combination of all the claimed features as presented in independent claims, which at least include the method of claim 22, further comprising the step of capturing images from the system and post-processing a digital representation of the images to reverse the effects induced by the optical phase filter as claimed." Office Action, page 6. It is submitted that the Examiner meant to cite "the method of claim 23" instead of "the method of claim 22" since claim 22 is cancelled and claim 23 is an independent method claim. The above comment is submitted to clarify the record in this application, and the Examiner is invited to refute or support the comment.

Atty. Docket No. 420228

Conclusion

In view of the above Amendments and Remarks, Applicant has addressed all issues raised in the Office Action dated 7 October 2005, and respectfully solicits a Notice of Allowance. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

The \$120 fee for a one-month extension of time to respond to the current Office Action and the \$600 for the three (3) additional independent claims is enclosed. Applicant believes no other fees are currently due, however, if any fee is deemed necessary in connection with this Amendment and Response, please charge Deposit Account No. 12-0600.

Respectfully submitted,

LATHROP & GAGE L.C.

Date: 2-3-06

By: Curtis A. Vock

Curtis A. Vock, Reg. No. 38,356
4845 Pearl East Circle, Suite 300
Boulder, Colorado 80301
Tele: (720) 931-3018
Fax: (720) 931-3001

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☒ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.